SCIENCE

NEW YORK, OCTOBER 20, 1893.

INDIAN RELICS.

BY C. M. PLEYTE, KEEPER OF THE ETHNOLOGICAL MUSEUM OF NATURA ARTIS MAGISTRA, AMSTERDAM.

SOME time ago Mr. R. J. Neervoort v. d. Poll, well known among entomologists, invited me to see his ethnological collection, the specimens of which amounted at that time to about a hundred and fifty. Though his collection has been brought together by buying and exchanging a new object here and there, it contains, as nearly every private collection does, weapons, utensils, dresses, tools, etc., from all parts of the world. The greater part of them, however, were brought back from Indonesia (the Malay Archipelago), especially from the island belonging to the Dutch crown, as well as from our colonies in the West Indies, especially Surinam. This country was visited by Mr. v. d. Poll himself, some years ago, with the purpose of completing his collection of insects. On his return from his journey, after the determination of the new additions had been finished, Mr. v. d. Poll went to Paris in order to make arrangements for the publication of these new specimens. It was on this occasion that he had the good luck to fall in with some very good old American Indian objects, the description of which I think may interest the readers of *Science*.

The reason why I think it worth while to publish them in this paper is that they are really relics, gathered at a time when the Indians had not yet experienced the influence of civilization so much as now-a-days, and, moreover, as the person who collected them was no less than the Prince Maximilian of Wied. Mr. v. d. Poll bought them from a friend of the painter Bodmer, one of the Prince's companions on his travels. Bodmer was rather badly off in his last days. He had scarcely enough to live upon. Therefore from time to time he sold some of the objects which were left to him to his friends, very glad to receive some money in exchange, and at last he gladly accepted the offer made by the lithograph N. N. for the rest of his curiosities and original drawings made when in America. The latter gentleman sold them to Mr. v. d. Poll, who entrusted them afterwards to the Ethnological Museum of the Royal Zoölogical Society Natura Artis Magistra, at Amsterdam, so that the remnants of this expedition, till of late lying forgotten in private profession, can now be studied by everybody who will take the trouble to visit the museum above mentioned.

The objects are nine in number.

I. *Pipe* with nicely carved bowl of green soapstone, somewhat in the shape of a very small tomahawk. The bowl is fastened to a reed stem, provided with a small, cylindrical, bone mouthpiece. *Blackfoot Indians*

II. *Tomahawk* made of a cylindrlcal piece of green-and-white spotted serpentine fastened in a wooden handle. The latter is a wooden strip bent round the stone. The two remaining ends are laid against each other and firmly bound together with a strip of buffalo hide of a reddish color, ending in a loop. *Mandan Indians*

III. *Pair of moccasons* of yellowish leather. The instep is richly decorated with blue and red porcupine quills. *Mandan Indians*

IV. *Pair of moccasons* of black leather, on the instep and at the sides docorated with dyed porcupine quills. *Blackfoot Indians*

V. *Medicine bag* made out of a dried dogskin from which the hair has been scraped off. The bag is split at the chest, and is drawn together by means of a hard leather ring round the neck. The head, legs and tail dangle loosely at the bottom part of the bag. The tail is ornamented with red flannel. *Mandan Indians*

VI. *Medicine bag* made out of a dried skin, the sides are ornamented with dyed porcupine quills and bundles of hair. *Mandan Indians*

VII. *Sheath* for a knife, made of leather, richly decorated with dyed porcupine quills and leather fringe. *Mandan Indians*

VIII. *Leather jacket* made of soft yellow leather, with short sleeves, decorated all over with blue and black bundles of hair fitted into little tin cones. On the front the totem is embroidered with silk, a black circle with two red ornaments in it. *Blackfoot Indians*

IX. *Buffalo robe*, the outside still showing the hair, the inside prepared and adorned with porcupine quills forming a striped, square pattern with bird-shaped ornaments at the sides. *Blackfoot Indians*

The costume formed by the Nos. I., IV., VIII. and IX. was taken from a Blackfoot chief, whose portrait, unhappily enough, is not found in any of the editions of the Prince's famous work on North America.

SCIENCE TEACHING IN SECONDARY SCHOOLS.

BY GEO. G. GROFF, LEWISBURGH, PA.

ATTENTION should be called to the very loose and imperfect manner in which many of the more popular textbooks for use in elementary and secondary schools have been prepared. A few years ago copies of an elementary work on natural history were sent the writer for examination. After looking it over, the publishers were informed by the writer that he could not endorse the b ook. In reply, he received a printed list of names of several hundred educators who strongly commended the work. This list was carefully studied, but not a name known to science could be found in it. The book referred to was written in such a slipshod manner as to contain misleading errors of statement on every few pages.

There is a very popular chemistry in use in secondary and high schools, of which it is affirmed that in the first editions the author said, "An old woolen shirt can be made to yield its weight of sugar!" Be that as it may, the errors still in the book after use in the schools for nearly a generation are numerous enough. The following may serve to illustrate: "We say, 'We are so warm that we pant.' Really it is the reverse. The panting is the cause of our warmth." Speaking of the borax beds of Nevada, the statement is made "There are hundreds of acres covered to a depth of nearly two feet with crude semi-crystalline borax." Of chloral hydrate it is remarked, "Taken in proper quantities it is entirely safe, and is exceedingly pleasant in its influence." "Albumen may thus be carried by the blood through the system, but when once deposited, it cannot be dissolved and washed away again." Probably no school books are so full of errors as those hastily prepared to meet the demands of the new temperance laws now in force in most of the states, requiring the effects of alcohol and tobacco on the body to be taught in the schools.

One of the best of these books several times makes the positive assertion that tobacco produces cancer in its users.

Another volume asserts that consumption may be caused by putting on spring clothing too early in the season! One also reads that cider-drinkers are peculiarly crabbed and cross, that tobacco makes old men illnatured, that sour milk is unwholesome, cheese is indigestible, *pork is a meat not fit to eat*, and bile has the properties of baking soda? Here is a fish story told in the words of a highly commended book: "The Esquimaux who live in Greenland, drink one or two quarts of oil, and eat several pounds of candles every day!" But see how a story will "grow" even in a scientific text-book. In the next number of the "series" written by the same author, and from the same reliable notes, doubtless, we read, "An Esquimaux consumes about twenty pounds of blubber fat daily, besides drinking several quarts of train oil." What it will be in the next volume, who can tell?

As to the style and accuracy of these "scientific" treatices, the following may be taken as samples: "The eyeball is a bag (!) almost round, thick and dull everywhere but in front, where it has a transparent covering called the cornea, meaning a horn. This is fitted into the eye just as a watch-crystal is fitted into a watch."! How lucid and true, now proceed, "The back chamber" (of the eye) "also holds a jelly-like fluid, called the 'glassy humor,' which allows the iris-curtain to float and move freely." Who don't understand that much at least?

Another matter in connection with these physiologies should receive attention. Many of them contain a statement, printed in a prominent manner in the first portion of the book, that they contain *"a fyll and fair treatmant of the nature and effects of alcoholic drinks and other narcotics in connection with relative Physiology and Hygiene."* When the books are examined, however, the "full and fair treatment" dwindles into statements true and imaginary, of the evil effects of alcohol on the body. There is no effort at all made to discuss the different effects of large and small doses, of the effects on a full and on an empty stomach, of individual idiosynerasies and not a word of the beneficial effects of alcohol and narcotics when properly used. There can be no doubt but this unfair, unscientific and untruthful manner of presenting this subject is having an effect, exactly the reverse to that which is intended. Children will soon find out that they have been deceived, and the result will be worse than if nothing had been said at all on the subject.

The strictures here noted apply to the books used in the public schools, and to a very limited extent to those used in academies and colleges.

BIRDS OF RARE OCCURRENCE IN NORTHERN COLORADO.

BY WM. OSBURN, NASHVILLE, TENN.

COLORADO is prolific in bird life. There the eastern and western forms converge. There mountain, valley, woodland, lake and barren plain, contribute their peculiar species, thus furnishing to the student a field most varied. When observers have completed the record, their labors will probably show a list approaching four hundred species and varieties.

During the years 1888, 1889 and 1890 I had opportunity to study the avi-fauna of a small section of the State. My field of observation was Larimer County, with Loveland, Colorado, as headquarters. Loveland is about seventy-five miles north of Denver, in the midst of a rich farming section, with the foothills some six miles to the west and the open plains a few miles east. During the period named two hundred and forty-one species and varieties were observed. All but a very few of these were actually taken in the field; their skins were preserved, and such data recorded as sex, measurements, color of iris, contents of stomach, etc. From this list I have selected ten birds which to me proved of unusually rare occurrence. Their enumeration may be of interest to other observers. It is not improbable that a few of these have hitherto escaped observation in the locality named and contiguous parts.

Micropalama himantopus. Stilt Sandpiper. Occasionally met with during the spring migration, in May and early June.

Pediocaetes phasianellus campestris. Prairie Sharp-tailed Grouse. This bird was formerly quite abundant.

Accipiter atricapillus. American Goshawk. A male of this species was captured on February 26, 1889, at Arkins, Colorado. A female was taken in the same locality on March 5. The male was much darker than the female, and with finer markings on the under parts, answering to the description of variety *striatulus.* Mr. Wm. G. Smith, a careful observer of birds, reported at the time that he had not seen a specimen of this hawk during five years residence. In his "Key to North American Birds" Dr. Elliott Coues says: "It breeds in mountainous regions as far south at least as Colorado, where I have seen it in summer.

Bubo virginianus arcticus. Arctic Horned Owl. A fine Horned Owl, which I have referred to this variety, was shot in the mountains and brought to me on Nov. 29, 1890. It was nearly white. A dissection revealed a large tape-worm in the back, above the intestines.

Colaptes auratus. Flicker. A typical Flicker was taken during the fall migration, September 24, 1889. While the hybrid form, exhibiting every conceivable gradation between *auratus* and *cafer*, is quite abundant, yet a typical *auratus* is seldom observed.

Scolecophagus carolinus. Rusty Blackbird. One specimen was taken in November, 1889. No other observation recorded.

Zonotrichia coronata. Golden-crowned Sparrow. Concerning the habitat of this species, Dr. Coues makes the following record: "Pacific coast (to Rocky Mountains?) from Alaska to Southern California." A small flock of these birds spent the winter of 1889 in a thicket along the Big Thompson. They were associated with Intermediate Sparrows. One specimen was taken on February 23.

Dendroica graciæ. Grace's Warbler. During the spring migration of 1889 a small flock of this species was seen near the foothills. One specimen, taken April 25, is in the writer's possession.

Cistothorus palustris. Long-billed Marsh Wren. Two specimens were taken in March, 1889. Its occurrence is apparently not common.

Among others collected, the following may be named as more common than the preceding, yet only met with occasionally: Golden-crowned Kinglet, Wilson's Warbler, White-throated Swift, Cedar Waxwing, Slate-colored Junco, House Finch, Arizona Goldfinch, Pallid Horned Lark, Woodhouse's Jay, Hammond's Flycatcher, Alpine Three-toed Woodpecker, Pigmy Owl, Prairie Falcon, Richardson's Merlin and American Golden Plover.

—"Our Own Birds," by Wm. L. Bailey, published by J. B. Lippincott Company, is an excellent little manual for those who wish to become familiar with the common birds of this country. It contains a number of half-tone full-page illustrations, with others in the text.

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CAN WE SEE THE PICTURE IN THE LANDSCAPE?

BY WALDO DENNIS, CHICAGO, ILL.

OFTEN while enjoying a painting I have wondered where lay the secret of transforming commonplace scenes into interesting and beautiful pictures. I have been entranced by paintings of which the scenes themselves, I am sure, would not have stirred my feelings. Coloring did not account for this magical change, thought I, for in both scene and picture they are the same. To say it was the artist's power to idealize, even if true, left the matter no clearer. Because "idealize" stood not for something known, but for something unknown, and thus, instead of clearing up the mystery, it only appeared to.

Lately while looking at a painting in the Art Building at the World's Fair, some light came to me. The painting was beautiful, and yet the scene was commonplace. At once came the question, "Was that landscape really so beautiful to the artist as he has made his picture? Did the artist really see, in the scene before him, the picture he has painted? In short, was the scene a *picture* to him before he painted it?" Thus meditating, I unconsciously tried to see the landscape as he must have seen it, to look at it through his eyes.

Evident at once was the difference between looking at a landscape and the picture of it. A landscape covers several or many square miles. In looking at it, our eyes wander over it, from place to place. To look to the left, a direction to the right has to be turned away from. While regarding the farmyards in the foreground, we see less distinctly the wooded hill of the background. As one part passes into view, another part passes out of it. In fact, every portion of the scene before us must be seen in its own particular direction, and with its own particular focal adjustment. The conditions of distinct vision thus imposed enable us to see one thing well at the cost of seeing all else faintly.

How different is all this in looking at the picture. The many square miles have been reduced to a square yard. The multitude of objects, which to be seen well require the eyes to wander about, and to constantly readjust themselves, have all been brought to the same plane, and can all be seen at one glance. Moreover, while looking at the square yard of picture your attention is not distracted, as in the scene, by a flock of blackbirds suddenly flirting up from among the cattle in the pasture, circling about in a whimsical way, and then as suddenly dropping down again in the same place. The man at the plow does not finally reach the end of his furrow, turn his horses and come back; nor does the wagon on the road move along as it seems to be doing, and compel your gaze to follow it till it passes behind the hill out of sight. All things are caught in an eternal pose, which offers no interruption to your gaze. You see it all at a glance, and you see it always the same, that is, without distracting changes.

In this transfer of a scene to canvas, plainly the beauty of the landscape is concentrated. The variety of color and form scattered through miles of extent is crowded into a glittering square yard. It is like the enchantment wrought for us as children by a fragment of looking glass. The glass reduced the landscape before us to a picture, and thus enabled us to comprehend it; beauty flashed out upon us, where before we had not so much as thought of there being any beauty, and I am persuaded that, in general, only as we have power in some way to picture the scene before us, do we gather its beauty. We may be greatly attached to a familiar scene; this attachment may help us to its beauty; but how much of this we see, depends on our power to picture the scene.

And here our question comes back to us: Did the artist see his picture in the scene from which it was taken before he painted it? But for an experience of my boyhood I should conclude that to see a landscape as a picture were out of the question. When a boy I was somewhat addicted to dreaming with my eyes open. As my reverie engaged consciousness, I was little aware of the scene before me. But as the reverie concluded itself the *scene* began to obtrude itself. In this condition of waking from what was passing within to a consciousness of what was present without, there was an interval, during which I saw the scene before me as a whole, as a picture. Consciousness not yet distracted into making a focal change was passively attentive to a larger and larger field of the retina. The eyes, in their staring fixedness, seemed literally optical instruments through which an inner self was peeping, and stealthily peeping, lest a disturbance should take away the opportunity by destroying the conditions. This experience was like waking from a delightful dream; it always left me feeling like one having visited another world whose beauty was unspeakable. Recalling this experience led me to conclude that the power to see natural scenes as pictures may be acquired. Subsequent trial has proved it to be true.

Of course we cannot escape our visual limitations. As the field of view becomes larger and larger, distinctness of the whole of it suffers. But experience shows this to be no serious obstacle. Our general familiarity with nature enables us to form a clear mental image from an indistinct visual impression. The man we see at his work or the cattle in the pasture need not be seen very distinctly for us to know what they are and what they are doing. In their contribution to the picture this is sufficient.

The enjoyment of standing at will in the midst of a gallery of pictures in nature's own coloring can be understood only by one who can see them. Whoever enjoys nature enough to look for her pictures will find them. And in them, once found, his eyes will be opened to beauty that he knew not of before. Thus to see and feel the unity in the scene before us, seems like seeing with other eyes than the physical, like neglecting external form and getting at the spirit of beauty.

CORAL FORMATIONS.

BY G. H. PERKINS, UNIVERSITY OF VERMONT, BURLINGTON, VT.

WHEN the old navigators, after long and weary voyaging, at last came upon the coral islands of the southern Pacific and gazed with delight upon the circles of green foliage lifted above the frothing breakers, verily they must have thought that they had found the Enchanted Isles.

Probably no portion of the earth's surface is more like fairy land or more wonderfully beautiful than a typical coral island. But the beauty of these islands, although so exquisite, is not their chief attraction, for as one learns how numerous they are, how unique their structure, how peculiarly they are distributed through the oceans, how unlike other reefs and islands is their form, elevation above sea level, and indeed everything that pertains to them, he becomes eager to know why they are as they are and by what processes they have come into being.

It soon becomes evident even to a very casual observer that the geological and chemical principles, which are sufficient to explain the existencc of other reefs and islands, are not satisfactory when applied to these, and that some different conditions must be sought to account for the different results which have been attained in these singular structures.

What these conditions are or have been in the past it is not easy to determine, and, although from the time of the first navigator coral formations must have excited curiosity, no theory to account for them was made known until in 1837 Mr. Darwin, after his voyage in the Beagle, published his well-known theory.

From the first this theory was received with general approval, nor is this strange, for it is at once so simple and so apparently sufficient that nothing more seems to be needed. This theory was also greatly strengthened by the endorsement of Professor Dana after his return from the Wilkes Expedition in 1842.

For many years Mr. Darwin's theory was scarcely questioned, and certainly there is nothing improbable in any of the conditions which it requires. The only question is, Do the observed facts warrant its acceptance? As will be remembered, Mr. Darwin supposed that the whole vast area in which coral islands are found has been slowly sinking for a very long time, that islands of the usual sort, which formerly existed, have wholly disappeared through subsidence, and that about these islands there grew masses of coral which in time formed fringing reefs, that as the island sank the coral grew upward more rapidly on the outer or seaward side because there food was more abundant, and as the island sank the reef would presently be separated from the island by a strip of water; that is, the fringing reef would become a barrier reef. Finally, the island having disappeared, the reef, would become an island of more or less annular form enclosing a lagoon that is an atoll.

So long ago as 1851, Professor Agassiz, after studying the Florida reefs, declared that he found no evidence of subsidence, and that the structure of the southern part of Florida must be explained in some other way.

So also Semper, in the Pelew and Philippine islands, Dr. Guppy in the Solomons, and Dr. Bain in the Bermudas, had been studying coral formations, and all these observers found the old theory inadequate to account for the structural peculiarities noticed.

Later, and more important than these, are the observations of the naturalists of the Challenger at Tahiti, which have led many scientists to reject the commonly received theory.

However great the dissatisfaction with Mr. Darwin's theory may have been, it was not given utterance until in 1880 Mr. Murray, one of the Challenger naturalists, published a theory quite unlike that which had been current. Although first stated by Mr. Murray, this theory is to be regarded as an outgrowth from the objections to the older one.

Mr. Darwin himself noticed that in some cases corals grew upon submerged platforms or banks and also that the growth was most rapid on the seaward side of a reef where food was most abundant, and all subsequent investigators have noticed the same fact.

Mr. Murray assumes a sufficient number of such platforms to afford foundations for coral growth, and that the peculiar form of reef or island would be determined by well-known conditions.

Of course the upward growth of the coral would be in a solid mass if growth went on equally, and this is sometimes the case, but usually because of the rapid increase of the outer zone of coral and because of the solvent action of the sea water upon the dead or weakly growing coral in the interior zone the forming island becomes annular, that is, an atoll.

Deep-sea soundings have proved that such submerged banks and islands as are demanded by this theory do exist and are more numerous than has been supposed, and also that by the accumulation of shells and all sorts of debris such foundations, if at first too deep, may be raised nearer the surface and into the coral-growing region.

On the other hand, mountain peaks, rising above the surface, may be worn down below it by erosion.

As atolls may begin as fringing reefs and may even at first be platforms of coral rock, so barrier reefs may begin as fringing reefs, and as they grow outward the solid coral be dissolved and worn away between the reef and the land, thus changing one into the other.

There are then these two theories at present before us. Which is to finally prevail? The naturalists of the Challenger expedition are fully committed to the new view and so are many leading English scientists.

If one seeking information should chance upon an article by the Duke of Argyle in the *Nineteenth Century* of September, 1887, or Professor Geikie's Presidential address before the Royal Physical Society of Edinburgh, he would probably conclude that the question had been finally settled in favor of Mr. Murray's views.

If, however, he should turn to the November number of the same periodical he would discover that no such result had been reached and that it is not probable that it soon will be.

Certainly when such an authority as Professor Huxley can write as he does in the latter article, "I happen to have spent the best part of three years among coral reefs, and when Mr. Murray's work appeared I said to myself that until I had two or three months to give to the subject * * * * * I must be content to remain in a condition of suspended judgment," it becomes us to be modest in expressing an opinion.

Should one still seek for information upon this subject he may find in the *American Journal of Science and Arts*, vol. XXX, 1885, sundry articles by Professor Dana in which there is very strong advocacy of Mr. Darwin's theory and opposition to that of Mr. Murray. While it would be idle at present to attempt to decide as to the value of either theory we may perhaps do well to consider some of the facts before us.

That there has been subsidence in great areas of the sea bottom cannot be doubted nor can it be doubted that there are great areas where there has been elevation, and in still other areas there does not appear to have been either rising or sinking.

Evidence is continually increasing that in different coral-growing areas different processes have gone on and that since all coral islands have not been made in the same way no single, all-comprehensive theory is possible.

Dr. Guppy found at the Solomon Islands that, adjacent to the shore, corals grew vigorously, while outside of this zone there was a space where debris from the shore so fouled the water that no corals grew, while still farther out they grew finely. It is easy to see that the first zone would make a fringing reef, the zone affected by debris would be open water, and the outer zone a barrier reef, and thus these varieties of coral formation be produced without the conditions of either theory. Nor is it at all improbable that other methods of coral island making may be discovered as further investigations reveal new facts, and, while it may be regarded as most probable that Mr. Murray's theory will be held sufficient to explain the larger part of the coral formations of the globe, it is also probabable that Mr. Darwin's views will never be wholly set aside, but will always be needed to account for extensive groups of reefs and islands, while here and there all over the region of coral island making there will be found phenomena which require other explanation because of special peculiarities.

THE PROTECTION OF OUR WILD PLANTS AND ANIMALS.

BY JOHN GIFFORD, SWARTHMORE COLLEGE, PA.

A FEW years ago an association for the protection of plants was founded in Switzerland at Geneva. Tourists, and even botanists, were guilty of such vandalism that many feared the extermination of certain rare plants. By the dissemination of seeds and other means, however, many species have been protected by this society in Switzerland and elsewhere.

Although we have forestry associations in this country we have as yet done nothing toward the protection of rare plants.

In south Jersey, for instance, there are many unusual and beautiful species, but owing to the action of winds, fires and voracious botanists they are becoming gradually scarcer.

Along the beaches of the seashore the forests are destroyed for the building of resorts, in other places they are buried by moving sand dunes. The *Schizæa pusilla* is a little fern, which is not found elsewhere in the United States. It grows in three or four isolated patches in the low pine barrens of south Jersey. One patch has already been almost wholly destroyed by forest fires, and from the others hundreds of specimens are carried away by greedy botanists every September. The extinction of this species is only a question of a very few years.

This applies to almost every locality in the United States. There are few places which cannot boast of a few rare species.

The writer knows of one instance where a class of young botanists exterminated a patch *Aplectrum hiemale*, in a region where it was very rare, by eating the corms.

In spite of game protective societies, owing to the thoughtlessness of sportsmen, many of our wild animals have disappeared. A few deer still linger in the pines of south Jersey, but every season their number is remarkably lessened. Had they a place of refuge where they could always remain unmolested, their extinction could be prevented.

It is hoped that the Government may set aside in every state a tract of guarded land. A few acres showing the nature of the country in the wild state will be appreciated more in years to come than at the present time. There the trees may remain untouched, there remarkable and unusual plants may grow in safety, and there the wild animals may find a refuge. The advantages of such a scheme are too numerous to mention. The retaining of a typical portion of each kind of territory in every state, together with its plants and animals, guarded every day of the year, would not only delight the naturalists and lovers of nature, but would insure at least a small portion of forest country here and there, which tends to lessen in many ways the destructive forces of nature.

Dr. Charles Dolley and others of the American Association for the Advancement of Education have arranged to collect and preserve on their property at Avalon all the plants peculiar to the beaches of the Jersey coast. This is one of the objects of the association, and it hopes to control some land in the low pine barren region where no man will be allowed to botanize or hunt.

*See Westwood's Modern Classification of Insects on Larval Mycetophilidæ.

SILK SPINNING FLY LARVÆ.

BY H. GARMAN, LEXINGTON, KY.

IN a brief paper printed in *Science* recently a silk spinning cave larva was described by me and referred to the order Diptera. Its general appearance and its habit of making a thread are features in which it approaches the larvæ of Lepidoptera, a resemblance which has been commented on by others in conversation with me since. Yet the larva in question is unmistakably Dipterous, and it was part of my object in publishing the note to call attention in an indirect way to the fact long, but not very generally, known,* that larvæ of certain flies approximate the Lepidoptera, in spinning silken threads. In saying that they produce silk, I wish, however, to be understood as in no way implying that the threads have the exact chemical and physical properties of the silken fibres made by the silkworm. They are silk from the biological, not from the commercial point of view. They are produced by special glands differing little, if at all, from the silk glands of other insects, are employed by these larvæ for a purpose, and are not consequently to be compared with the trail of slime left by a slug or worm.

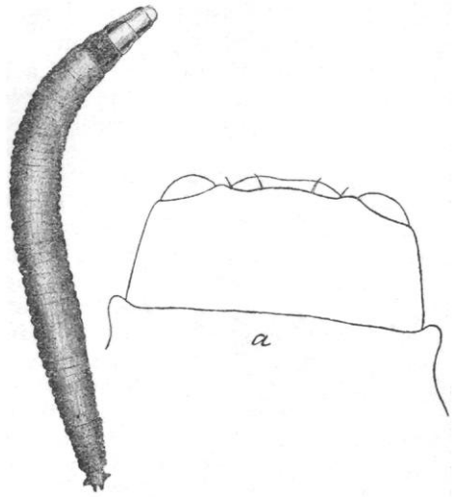

FIG. 1.

My attention was first attracted to such larvæ while making examinations of Kentucky caves. I have, however, been long familiar with other larvæ belonging to the same order, which habitually spin threads having a very important relation to their welfare. In small streams in McLean County, Illinois, occurs a larval Simulium which produces such threads. Another species is extremely abundant in rills in eastern Kentucky, where the rocks

over which water flows with considerable speed are literally blackened with it. Since the note referred to was published I have observed that these latter will when disturbed let themselves loose in the current and then shoot down stream emitting their threads at the same time so that they can check their descent and secure a fresh hold on the rocks, perhaps to return along the thread to their first position. By closing the blades of my forceps over the rocks I have repeatedly drawn out a string of these larvæ, each one suspended by the thread it had let out as it floated down stream.

In addition to this thread-spinning habit the cave larvæ have peculiarities of structure which render them worthy of careful study. I have already described two of them, and have collected several others in Kentucky. All are more or less vermiform, being long, slender, cylindrical, generally translucent, so that the internal organs show more or less distinctly through the body wall. The resemblance to a small Lumbricoid worm is heightened by the fact that their bodies are coated with a slime, the derivation of which is uncertain, but which is probably not

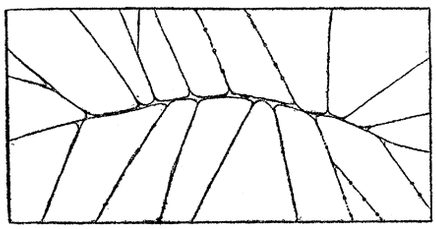

FIG. 2.

derived from the glands engaged in secreting the thread. There are common features also in the structure of the head and mouth-parts, and in the presence of a singular convex area above the base of the mandible resembling a very large ocellus. In several of those examined this is of enormous size, and gives the head a most bizarre appearance.

That they are Dipterous larvæ is sufficiently evident from their resemblance in general structure to larval Sciara. The recent discovery of the pupa of one of the species, with wing pads and halteres clearly apparent, confirms the opinion I had reached in this regard. While engaged in attempting to rear the adult of this species I received additional proof in the shape of a letter, quoted from below, from that most excellent observer and collector, Mr. H. G. Hubbard, together with three stages of a closely related species which he discovered some years ago in a cave in Jamaica. The larva of this species is closely allied to one found by me during the past August living in hammock-like webs slung across depressions on the under side of stones and lumps of earth. The latter species was taken in a small cave near Lexington, and has afforded me an opportunity to observe more closely the product of the spinning glands of these interesting insects, and to watch the larva while making its web. This larva shows the same attachment for its web as does the species previously described. In one instance an example was compelled by particularly rough treatment to creep to the earth at one side of its web, where it remained drawn up in an uncomfortable position, but turned promptly when left unmolested for a moment and made its way back on the web again. Three living examples were at one time thrown into a watch glass of water preparatory to killing them in an extended condition, when every one fastened itself to the bottom by pouring out the glutinous material from its mouth and then began to wriggle like an uncomfortable earthworm, always with the whole length of the body free from the glass. In this case the slime coating of the body showed no tendency to glue the body down, whereas the matter from the glands opening at the mouth retained all its adhesive properties—an evidence that the slime is of different origin, and is produced for a different purpose.

Since Sept. 3 a larva of this sort has been kept alive in a bottle. In the bottom of this is about half an inch of earth. The larva spends most of the time in the empty upper part and makes its way about in this space, building a web as it goes, with surprising rapidity. It is often fully two inches from the earth and very rarely touches the side of the bottle with its body. When engaged in web-building, it sways the forward part of the body from side to side until it strikes some object, when the thread is attached by a touch, and as the head draws away is seen to be connected with that underlying the whole length of the body. When first drawn out these threads appear under a hand lens as smooth and dry as any spider's web. The central strand upon which the larva usually lies, however, has a good deal of slime along it, forming triangular masses at the points of divergence of lateral threads. When they have been used for some time the lateral threads of a web may also show slime upon them in the form of minute scattered spherical droplets (See figure). As far as I can determine all this slime comes from the surface of the body. Occasionally a portion of the body has been seen to come in contact with the bottle, where a slimy trail nearly as wide as the body was left on the glass. If this slime had the properties of the glutinous material of which the thread is made the larva would have difficulty in getting about. On the contrary it is rather fluid, and the droplets left along the strand can be seen to be drawn up by the force of capillarity as the tip of the body passes them.

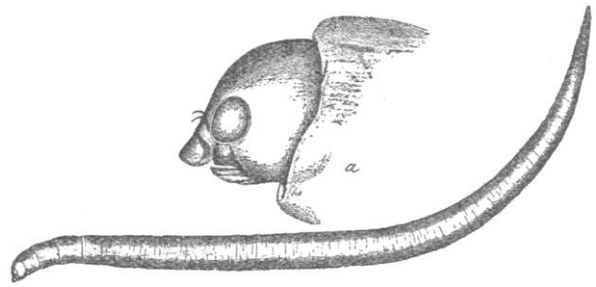

FIG. 3.

These larvæ live concealed in damp situations and it may be, as suggested by Mr. Hubbard, that the threads do not become perfectly dry. They are so fine and delicate that it would be difficult to determine this matter. The thread-making larva previously discribed in *Science* is at all times completely exposed on the rocks. I have had no recent opportunity to examine its threads, but the impression I have of those seen last spring is that they were dry. But the question whether or not the threads of these larvæ are completely dry has nothing to do with that concerning their essential nature. If silk must be chemically dry, then of course the thread of larval Simulium is not silk. It is not the product of a gland having to do with digestion. It is not a trail of slime left from the surface of the body. It is a special product, used by these larvæ exactly as the silkworm uses the product of its sericteria (even to enclosing the pupa in some cases in a very slight approach to cocoon).

Mr. Hubbard's larvæ are very much like the species upon which my observations have been made, and their threads of slime very probably have a supporting axis of other material. The following quotations are from his letter accompanying the specimens so kindly sent me. I hope to publish descriptions of all the cave species at

some future time. Adult Mycetophilid flies have been collected by me on several occasions in parts of caves in which my larvæ were found, but it will be necessary to "breed" the pupæ and adults from the larvæ before the stages can be associated with certainty.

"I have never seen your larva, but I have from a cave in Jamaica, W. I., a Dipterous larva of similar form and habits, except that it lies suspended free from the rock on a thread of ropy slime-like material. I send you specimens of this larva and also its pupa in alcohol, likewise the imago which I bred from the pupa. You will see that it is a Mycetophilid fly. No doubt you have noticed similar flies in fungi and particularly on coatings of fungi under damp logs in dark woods. The larvæ of these fungus-inhabiting flies are similarly elongate creatures and form thread-like tracks of slime across the surface of the fungus. I have frequently observed that they can be made to glide back and forth along this track precisely in the manner of your cave larva, and that they can not be induced to quit their hold upon the thread. The interesting point to which I would like to call your attention is this. The silken thread of your Mammoth Cave larva and the slime thread of my Jamaican larva as well as the slime track of the fungus Mycetophilids may all be similar products of the salivary organs and more or less allied to true silk. The Jamaican cave fly makes a thread of six or eight inches in length fastened at both ends to the rock on the underside of a ledge or stalactite, but otherwise hanging free, and on this both larva and pupa are found suspended as in a hammock. In the damp air of the caves the thread never dries and hardens like ordinary silk, but remains viscous and slime-like as in

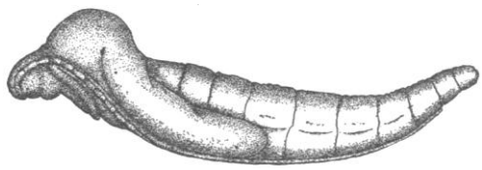

Fig. 4.

the case of other Mycetophilids. Nevertheless it possesses greater strength than an ordinary filament of mucus and it occurs to me that it is nothing more or less than a form of silk which does not lose its moisture and become hard. I have read somewhere quite recently of a process for the manufacture of artificial silk from a collodion produced by the action of nitric acid upon palm fibre. This silk remains moist until passed through anhidrous ether, which removes the moisture and hardens it. I would like much to know whether the silk thread of your cave larva is not also somewhat viscous, and it would be interesting also to note the action of ether upon it.

"In the *American Entomologist*, Vol. III., p. 30, 1880, I published a brief account of cave life in Jamaica. The article refers to the fly as follows; 'A Mycetophilid fly is found upon the stalactites, where its vermiform larva may also be seen suspended by ropes of slime.' Referring to my original field notes I find the following: 'Drunilly, Parish of Trelauny, Jamaica, W. I., April 18th, 1877,—among notes of examination of a large cave, much frequented by bats and containing many tons of bat guano—under ledges of stalagmite, long Dipterous larvæ slung in glutinous threads. Pupæ also collected slung in same manner. Probable imagoes also found. (I subsequently observed a pupa disclosing the fly and took specimens of all the stages.)' "

Explanation of the Figures.

Fig. 1. A dorsal view of a Mycetophilid larva found under a log. a, an outline of the head as seen from above.

Fig. 2. A web of one of the cave species.

Fig. 3. A web-making cave larva. a, an enlarged side view of the head.

Fig. 4. The pupa of the larva represented in Fig. 3.

SCARS ON APPLE TREE TRUNKS.

BY FRANK BOLLES, CAMBRIDGE, MASS.

Old apple trees in New England are almost invariably thickly dotted with round scars in their bark. Chains of small holes seem at some more or less distant date to have been bored in the trunks and larger limbs, but to have healed without injury to the tree. I have seen trees which bore thousands of these marks, arranged with some appearance of regularity in rings encircling the trunk and extending tier upon tier from a few inches above the ground to a point much higher than a man's head. In meetings of ornithologists I have heard many of those best informed about birds' habits say that they were unable to name the maker of these marks. Farmers generally charge the Downy Woodpecker with doing the work, and they often call him a Sapsucker in consequence. Many people suppose that the holes were bored a long time ago, and that they are not now made, hence the impossibility of observing the bird while making them.

For several years I have kept close watch upon my old orchard at Chocorua, N. H., hoping that I might catch the little Sap-sippers at work. While my experience with the Yellow-breasted Woodpeckers inclined me to suspect them of being the birds concerned, I did not feel at all sure that the Downy, who is so fond of stealing a drink of sap from the drills of the Yellow-breasted, might not have learned to do some boring on his own account. This autumn I noticed half a dozen freshly made holes in a very old apple tree. That proved clearly the continued existence of the unknown worker. During September both Downy Woodpeckers and the Sapsuckers were abundant and very busy in my apple trees. The Downy was fearless and honest in his manner. He was after insects and he showed no shame and little timidity. The Yellow-breasted Woodpeckers, on the other hand, were very shy, and flew from a tree almost as soon as I came within sight of it. This led me to watch them persistently, and at last, not long before I was called back to Cambridge, I had the satisfaction of seeing one at work, drilling and drinking. After making perfectly sure that he was cutting new holes and drinking, I examined the holes closely and satisfied myself that they were identical with the kind so long in dispute. To wary *Sphyropicus varius*, therefore, in his autumn migration, is to be assigned the fretting of our old apple trunks. That he does all of this work, I believe, but cannot, of course, affirm without more evidence.

A MISTAKE IN TEACHING BOTANY.

BY B. FINK, FAYETTE, IA.

Under the above caption I wish to enter a protest against the method of teaching botany still in vogue in certain colleges and high schools. If the error named below prevails in any large University, it needs correction there as well. It exists in our village schools, and will till the higher schools make a change for the better, and send out teachers correctly trained in the subject.

The mistake is the old plan of a spring term in botany confined to a study of phanerogams, followed by the analysis of from fifty to one hundred plants. This way of studying botany came into use when the microscope was scarcely known among the masses, and when the eco-

nomic interest of the lower orders of vegetable life was not well understood.

It is a source of pleasure to be able to name the common flowering plants, and the practice in analysis is good; but the teacher might better tell the names of the plants and save the time for more important work if the pupil can spend only one term upon the study, and as for the analysis, experience shows that a large part of the work not done under the supervision of the teacher is accomplished by ascertaining the common name and then going to the index.

Some teachers who have followed the old line in elementary botanical instruction will hardly be convinced that other matter should precede. They think that phanerogams are the most noticeable plants and should therefore be studied a whole term even if the lower forms are never known. The fact that they are so noticeable that any one who is really interested and who has had some work in observing and describing phanerogams will learn their names by analyzing, or in some other way, is my reason why the limited time often given to the study should not be devoted exclusively to this class of plants.

Some who have been going on in the old rut will contend that phanerogams were the first plants investigated, and that the order of presentation should follow that of investigation. Let us see. In geology, investigation began at the surface, with the latest formation; but in the study we begin with the deepest stratified rocks, the first formation. In zoölogy the highest forms of life were first studied and first present themselves to the observer, but here again the order of presentation has been changed so that it is the reverse of that of investigation.

However, I think it is not of so much importance where we begin as that we give first a general knowledge of the orders of plants. If those who have been confining their work to flowering plants will give half of it to cryptogams I will not find much fault with them for beginning with the highest order. Yet I think I have proven that the other way is as good without even introducing the principle of going from the simple to the more complex.

Every one who studies botany at all should learn something about bacteria, which play so important a part in our welfare. The same may be said of the economic smuts, mildews and rusts, and many other forms that I need not mention. Vegetable physiology should also form an important part of the work of the first term if it is to be the only one, and the necessary time can be gained by omitting the analysis of so many phanerogams and substituting the examination and description of a plant from each of the more common orders, using the microscope when necessary.

Instead of the old plan I would have all schools, during the first term, take up the orders, proceeding from the lowest to the highest, and close the work with the leading facts of vegetable physiology. I would divide the time equally between cryptogams, phanerogams and physiology. This both gives the best foundation on which to build, and is the most essential knowledge for the student who can not give more time to the subject.

FUNGI VERSUS INSECTS.

BY GERALD MCCARTHYR, RALEIGH, N. C.

DURING the last twenty years the number of species of noxious fungi and insects infesting American fields, orchards, woods and storehouses has increased at a most alarming rate, with a commensurate increase in the damage they inflict. The time was when the substantially complete destruction of any crop by these pests was so rare as to be regarded as a special visitation of Providence. This increase is undoubtedly due to the perfection of modern commerce, which has made cosmopolitans of species formerly restricted in habitat, and to the opportunity for rapid multiplication that our large solidly planted fields afford. Notwithstanding the vast amount of study which has during the same decades been devoted to these pests and the many differentforms of apparatus, formulas and methods which have been devised for combatting them, the damage still done is very serious. In fact intelligent and practical men say that the claims put forth by economic scientists have not been fulfilled. While the copper salts against fungi and the arsenites and kerosene against insects have in individual cases given good results, they have not apparently reduced the numbers of these pests. The use of these substances, too, is not without drawbacks. The acrid copper mixtures often damage the trees or plants nearly as much as the fungi would have done, and fruit plastered with these chemicals does not sell well. To be sure, it is not necessary to plaster fruit with the fungicide, nevertheless it is done, and where spraying is in general use the fruit as marketed is seldom free from its presence. An example of this, which has made a vivid impression upon my mind and stomach, is a lot of Catawba grapes grown near Seneca Lake, N. Y., and sold in Raleigh, N. C. These grapes were considerably spotted with the Bordeaux mixture. As an experiment I purchased and ate a bunch of these grapes, rejecting the skins,—an experiment I am not likely to repeat very soon! The flavor was quite spoiled by the presence of the chemicals, and the effect upon the digestive organs was anything but pleasant. The use of chemical fungicides, like the use of patent medicines for human ailments, has a tendency to cause the user to neglect hygienic precautions, since these latter require more foresight and labor than the former. In spite of all that fungicides have done, the annual losses caused by noxious fungi are still, for the United States alone, $300,000,000.

The losses occasioned by noxious insects are scarcely smaller. In a single year Illinois has lost $75,000,000 by the clinch bug and Texas has lost $20,000,000 by the cotton caterpillar.

The capital fault in all topical treatment of these pests is that it is effective only so far as the treatment goes, and for the time being. Let us suppose A., B. and C. to be neighboring fruit growers. A takes every practicable hygienic precaution by burning all infectious matter, and by cultivation and fertilization stimulates his crops to outgrow their enemies. B has unlimites faith in his "pizen," and applies it with a liberal hand. C is a "one-horse" farmer and has no faith in anything. He lets the bugs alone. The net result is that C grows more fungi and insects than fruit, and enough to devastate his neighbors' crops after his own are ruined. B has bespattered his trees right and left and caused most of the leaves to drop or shrivel up, followed by the fall of the immature fruit. A in spite of all his trouble and expense sees his crop ruined, or if he overcomes his prejudice against the use of chemicals, saves only a part of the crop and that more or less deteriorated. Surely there is something lacking in this method of procedure!

What is wanted is an automatic antipest destroying agent which will do its work quickly, thoroughly and without the aid of such men as farmer B and in spite of such men as farmer C. Such an agent many think we have found in pathogenic, contagious disease producing fungi or bacteria. It is well known to the farmers of the west that in some seasons the swarming multitudes of clinch bugs after devouring the crops disappear suddenly and as if by providential interposition. This disappearance usually follows a period of wet weather and does not as a rule occur until the pests have done irreparable damage and increased until their loathsome presence is

everywhere found. The real cause of this sudden disappearance has been found to be a contagious bacterial disease whose rapid dissemination is favored by wet weather and by the crowding of the insects into restricted areas as the food supply decreases. In this case the disease is left wholly to spontaneous development, but it is reasonable to suppose that were the disease producing bacteria artificially cultivated and multiplied, which is readily done in properly equipped laboratories, and held as a magazine to supply the germs as soon as the first insects are seen, the pests might be swept away, at a merely nominal cost, at the beginning instead of at the end of their destructive career. This is not all theory! In the United States excellent results against the clinch bug have been obtained in Kansas, Illinois and other states. In Europe very satisfactory results have been obtained in combatting the "white grub" (*Melolantha vulgaris*), by means of the fungus, *Botrytis tenella and B. bassiana.* In this country the most satisfactory results have been obtained from *Sporotrichinm densum* and *Empursa,* several sp ecies.

This method of combatting noxious insects is now attracting widespread attention from German and French scientists and promises much for the future.

LETTERS TO THE EDITOR.

***Correspondents are requested to be as brief as possible. The writer's name is in all cases required as a proof of good faith.

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

INDUCTIVE PSYCHOLOGY.

I WISH to thank you for your appreciative words and criticisms of my "Inductive Psychology," which was hastily prepared for private use rather than to stand the test of criticism for general circulation; I am pleased that more defects are not at once discovered. I think, however, a little explanation from me is necessary upon one point. In writing every sentence of the book my principal question was, what experience of the pupil will this appeal to ? what thoughts and observations will it suggest ? and not, how can I most logically state these truths so as to completely cover the subject? The aim is not a complete treatment of the science, but an *introduction* to it that shall give the pupil psychological knowledge, power and vocabulary that will enable him to continue the study in both living subjects and books. To such an extent is this true that inferences as to what portions of psychology I value most cannot be correctly made, for my principle of selection was not scientific value and importance but pedagogical value to the pupil at this stage of the study.

Now, Mr. Editor, however much you may disagree with my use of the word "inductive," if you will lay aside the expectations that the word "inductive" in the title aroused in your mind, you cannot but see that the book is pedagogically essentially different in method from any other text-book on psychology. I feel as if explanation on this point is due to myself; for if the book is not different in method of presentation from other psychologies, I have no excuse for writing it. The following, however, from a teacher of psychology, confirms me in the belief that I have such an excuse. "The book is the best I know of from the *teacher's* standpoint. It illustrates a method of treating the subject which I find in no other book. So far as I know, most text-books have been elaborated without regard to the pedagogics of the subject, but only the logical and scientific arrangement of the facts enumerated; but I feel that this cannot be said of yours."

E. A. KIRKPATRICK.

Winona, Minn., Sept. 25, 1893.

THE SOUNDS OF R.

As Mr. Melville Bell complains, in your October number, that the sounds of R have been treated unscientifically in my "Introduction to Phonetics," (Sonnenschein, London, and Macmillan, New York, 1891), I beg to observe that the difference between us arises from the difference in the facts observed by each.

In my pronunciation, for instance, and in that of cultivated English people of the present day, his ear would, I am sure, observe no difference between *alms* and *arms*, or between *laud* and *lord.*

In my treatment of the *r* sounds in English, I am supported by the evidence of all competent observers of the best English spoken in the south of England in the present day, and the leading phoneticians are also agreed in regarding this as standard English. I refer to such men as Dr. Sweet, Prof. Johan Storm, of Christiania, and Prof. Victor, of Marburg.

If I were making a study of American English it is probable that my observations would be in accord with those of Mr. Melville Bell. LAURA SOAMES.

Brighton, England.

THE ABSENCE OF AIR FROM THE MOON.

SEEING in the journal *Nature*, of London, date August 31, 1893, the announcement of a paper entitled "The Moon,s Atmosphere and the Kinetic Theory of Gasses," to be read next week at the meeting of the British Association at Nottingham by the author, Mr. G. H. Bryan; and since this subject was treated by me in *Nature*, Nov. 7, 1878 (15 years ago), I wrote to the author, Mr. G. H. Bryan, in reference to this. He has informed me to-day by post that this subject was dealt with in your journal, *Science*, of Feb. 24 last by Sir Robert Ball, who sent his communication to you as original, although Mr. Bryan considers it "identical in substance" with my letter in *Nature* (above mentioned) entitled "A question Raised by the Observed Absence of an Atmosphere in the Moon " (*loc. cit. sup.*)

As Sir Robert Ball makes no mention in your journal of my letter (in *Nature*). I merely wish to claim just priority here for the theory as mine and not his; since it is discussed as his—Sir Robert Ball's—in subsequent numbers of *Science*, such as that for August 18, 1893, in a paper by Prof. Liveing, of Cambridge, England, who suggests a further application of the theory in an article entitled "The Aemosphere of Stellar Space." To make a reclaim is somewhat of a task, and it would be fitting if an author's work were voluntarily recognized without his incentive; but I cannot do otherwise under the circumstances than mention the matter to you in this letter. Mr. Bryan informs me that his paper deals with "the bearing of statistical calculations on the theory," and he makes "no claim to originality except in the numerical results arrived at."

There may doubtless have been some advantage in Sir Robert Ball treating of the theory in question in your journal; but I am surprised at his not mentioning my name in connection with the theory.

S. TOLVER PRESTON.

Hamburgh, Germany, Sept. 9.

FOSSILS OF THE BRIDGEPORT QUARRIES.

ONE interested in geology, while looking over the fine exhibit of Ward's Natural Science Establishment in the Anthropological building at the World's Fair, and also the geological exhibit in the Government building will notice that the finest crinoids and other fossils of the upper Silurian, Niagara Terrane, are labeled "Bridgeport, Ill." Looking up Bridgeport on the map, myself and friend found it to be only a portion of Chicago, situated

on the Chicago River. Taking an Archer Avenue car from down town we soon found the limestone quarries for which we were seeking. At this place the Niagara Limestone crops out, and having been found to produce a very good quality of lime, has been extensively mined and large lime kilns erected.

Having obtained a permit from the office of the Lime Company, we descended into the pit, which, on looking up from the bottom, appeared like a large amphitheatre of rock.

They had just finished blasting before we arrived, hence we found the place most favorable for collecting fossils. For several hours we climbed over the rough masses of rock, hammer in hand and stowed away in a large bag the choice specimens found. The most abundant fossil was an undetermined species of Macrostylocrinus, of which we collected several dozen fine specimens. Next in abundance was the large crinoid *Siphonocrinus nobilis*, Hall, of which we collected eighteen choice specimens, also specimens of the following crinoids: *Eucalyptocrinus chicagœnsis, E. rotundus, Holocystites alternatus*, and *Caryocrinus ornatus*, Say. The most abundant coral was *Japhrentis Turbinatum*, Hall. We also found *Platyceras Campanulatum, Amphicœlia, neglecta*, McChesney, Trilobites, Brachiopods, and a very fine Ammonite.

In this way one interested in geology, while visiting Chicago, may fill in an odd day by collecting some interesting specimens. PAUL VAN RIPER.

Niles, Mich.

COON CATS.

SPEAKING of cats, I saw, in a private house in Chicago recently, two cats which the owners called "coon cats." They had been obtained in the edge of the forest around Moosehead Lake, and it was claimed that they were hybrids, or descendants of hybrids of the domestic cat and the raccoon. They were larger than the ordinary house cat, had very coon-like countenances and bushy coon-like tails that were always expanded. One had the habit of ascending something high and resting stretched out, and their motions when in a little hurry were a coon-like gallop.

The claws were retractile, the foot digitigrade. I did not examine the dentition, but could find nothing but appearance that indicated a coon kinship. They interbred with the common cat. Can some one tell me more about them? J. N. BASKETT.

Mexico, Mo., Aug. 28.

DAMAGE TO COTTON BY LIGHTNING.

THE communication of Mr. Frank E. Emery on "Damage to Cotton by Lightning" in your issue of Sept. 8, prompts me to communicate the following facts, bearing directly on Mr. Emery's subject.

For thirty years prior to 1890 some cotton fields at Goldsboro, N. C., owned by the State for the use of the Colored Insane Asylum, have been "struck" by lightning. Occasionally the fields were spared, and then again they suffered two or three times a year. Each stroke would destroy from one-quarter to one-half an acre. The lightning would strike very near the same place every year. In the year 1890 electric light wires were run from the city lighting plant to the Asylum. During the summers of 1890 and 1891 the poles near where the lightning was accustomed to strike, were badly split up. In the summer of 1892 lightning arresters were placed near these points, and since that time there has been no trouble from lightning. Since the wires have been strung on this pole line, lightning has not struck the fields, the wires protecting them perfectly.

These facts are vouched for by a gentleman residing in Goldsboro, who lived on the farm above mentioned before it came into the possession of the State and for the last few years has been manager of the electric plant, thus being acquainted with all lightning troubles that his plant has had to contend with. A. F. MCKISSICK.

Auburn, Ala., Sept. 23.

RHYTINA GIGAS LINN. AT PRINCETON.

IN numbers 522 and 523 of *Science* may be found descriptions of the skeleton of Steller's Sea-Cow (*Rhytina gigas Linn.*) as preserved in the various museums. The Museum at Princeton, New Jersey, has lately come into the possession of a most beautiful set of casts of *Rhytina*, which were obtained from Mr. Robert F. Damon, of Weymouth, England, and are an exact reproduction of the originals found at Behring's Island, and secured by the late Robert Damon, F. G. S., through Dr. Dybowski and presented to the British Museum of Natural History at South Kensington. (*vide* description by Dr. H. Woodward, F. R. S., Quart. Jour. Geol. Soc., 1885, XLI., pp. 457-72). The casts in the Princeton Museum are the following: cranium and jaw (length 68cm) brain cavity, dorsal, lumbar and caudal vertebræ, five cervical vertebræ, atlas and axis, three auditory ossicles, scapula, humerus, radius and ulna. JOHN EYERMAN.

Oakhurst, Easton, Pa., Sept. 22.

SUGAR FROM CORN STALKS.

MR. STEWART'S articles on this subject were intensely interesting and his investigations will doubtless lead to important economic results. As an item of news in this connection I may say that I have a neighbor who made sugar from corn stalks nearly forty years ago. She extracted the sucrose partly by diffusion (boiling the stalks in water) and then by pressure and obtained a sugar nearly white in color and excellent in flavor and sweetening power. A. STEVENSON.

Arthur, Ontario.

"CURIOUS EARS OF INDIAN CORN."

MR. HERSHEY, a recent correspondent in *Science*, speaks of a maize plant producing a cob at the summit of the stalk where we usually find only the tassel of staminate flowers. Such cases, I think, cannot be uncommon, I observed three last year within a small plot of a few square yards. This year a neighbor showed me an even more curious variation of the same kind. The stalk terminated in a spike of about 8 inches long, the upper half of which had contained staminate flowers, while the lower half, which was considerably stouter, contained immature grains. It was in fact a small cob without husks. and the grains were greenish in consequence. Branching off from the stalk at the base of the cobs were two slender pedicels of the remains of staminate flowers. The cob on this specimen contained no staminate flowers, but they were quite numerous on the stunted cobs which I saw last year. A. STEVENSON.

Arthur, Ontario.

EVOLUTION OF SCIENCE TEACHING IN PRIMARY SCHOOLS.

IN *Science*, No. 554, Dr. George G. Groff well shows how insufficient are the means provided in certain professional schools, for properly instructing and training teachers for science teaching in secondary and primary schools. The numerical results of his tabulations certainly place the normal schools of Pennsylvania on the side of tradition as against progress. The ratio of grammar teachers to science teachers is five to four, and the number of teachers of mathematics is approximately that of the teachers of science.

To show that such a state of affairs is not without exception, I will mention the state normal school of Michigan. The faculty of that institution comprises about twenty-five persons (exclusive of the practice school), of whom *four* are assigned to the department of English language and literature, *four* to the department of mathematics, and *six* to the two departments of science. It is not a dozen years since only one teacher was engaged exclusively in science teaching, but the rapid development of science courses, along with specialization of departments, has brought the present gratifying conditions. But what appears to me of much greater significance is the introduction of science teaching into the practice school. The catalogue of that department outlines a course in science studies for the grades one to eight inclusive, making it equally prominent with the other subjects. This course is of necessity rather crude, and the teaching, I venture, is more so, yet the hundred and more young teachers graduated from the institution each year must carry away with them many practical ideas of the new work, gained during their senior year of observation and practice teaching.

Having at hand the catalogues of the several normal schools of Wisconsin and Minnesota, I am pleased to find in them the same evidences of progress. As four or five schools are sustained by each of those states they are necessarily much smaller than the Michigan institution, consequently department lines can not be so strictly drawn around related subjects, and numerical comparisons are not easily made. It is noticeable, however, that the sciences are generally taught by persons who devote their energies entirely to that work. But it is the prescribed courses of the graded practice schools that show best the right tendencies of these institutions.

That science teaching in primary schools falls far short of our "dream" is true. That many successful efforts have been inaugurated is also true. The writer enjoys the personal acquaintance of several energetic young principals and superintendents who have organized science courses in their schools, and can recall numerous instances of teachers who are doing creditable work. A very few cities (Muskegon is the only one known to me in this state) have tried the plan of a special teacher or supervisor of science. Under the present conditions this is doubtless the best plan for cities of sufficient size to justify the expense, provided the person employed is a teacher and not a machine worker. The time and energies of the special teacher should be about equally divided between the pupils and the regular teachers. While doing considerable direct teaching in the school rooms, the best work of this functionary should be the instructing, training and inspiring of the teachers, so that, though they may not become at once ideal exponents of the methods of science, they will at least be more willing and efficient helpers.

The present need in science teaching is not so much in the matter as in the manner. Formal dogmatic teaching of the mere facts of science can only add another burden to the crowded curriculum. Rightly used, no other line of work gives to school life so many points of contact with real life. Observation, investigation, experiment, stimulated and directed by the teacher, should be the directions of greatest activity, and discovery should be one of the chief aims and rewards of the pupil. Instead, the average teacher usually forestalls the best activities of the child by beginning with the announcement of what should be the conclusion.

Where the new work has been introduced it is too often regarded by both teachers and pupils as a strange appendage that has in some way become attached to the body of educational matter. It should and will become a properly related part of the organic body. To change the figure, I know from observation that the announcement "Get ready for the science lesson" means to the pupils "Get ready for the weekly dose of this new educational medicine." Experience shows that it is sweet and pleasant to many; to some it is almost nauseating.

The desired all-round improvement in the preparation of teachers must be a gradual evolution from the present movement. No college or training school course is sufficient in itself. The preparation of the future teacher who shall successfully teach the elements of science in their proper relations to other subjects must begin in the kindergarten and continue throughout, constituting an educational experience in which the teachings of nature contribute their equal share.

The "thinking people" who need no argument that the elements of science should be taught in the primary schools are a small minority. In most instances where teachers or school officers have undertaken the work in a systematic manner they have been permitted by the indifference rather than the active consent of the majority. The advocates of science teaching may well be thankful for this toleration of indifference and should make the most of their opportunity.

C. D. McLouth.
Muskegon, Mich.

Birds That Sing in the Night.

The notes which from time to time have appeared in *Science* with reference to the nocturnal singing of birds demonstrate that a considerable number of species are known to exhibit this eccentricity. From my own observations I can corroborate some statements heretofore published, and, I believe, add one or two to the list of daylight songsters guilty of keeping very late hours.

I remember hearing a song sparrow (*Melospiza fasciata*) execute his full song at ten o'clock one dark and cloudy May night in western New York. I listened some time for a repetition of the serenade, but none was given. I have known the catbird (*Galeoscoptes carolinensis*) to sing in the moonlight. During a term of moonlight nights in August I heard the notes of a black-billed cuckoo (*Coccyzus erythrophthalmus*) nightly at frequent intervals for about an hour shortly after midnight. But with the cuckoo this is a well-known occurrence. I have more than once heard at night the twitter of chimney swifts (*Chætura pelagica*) from a chimney.

While on a summer camping expedition in the Cascade Mountains recently I heard cries of the raven (*Corvus corax principalis*) in the darkness, and was awakened on several nights by strange bird notes from the tree tops above our camp. The song—for it might be called such—was presumably executed by some small bird and consisted of a clear plaintive whistle having a tremolo ending. I was at a loss to account for its authorship, for the only bird to be found about the camp in the morning, aside from some woodpeckers, was the Oregon jay (*Perisoreus obscurus*) which I was reluctant to credit with possessing such a voice. However, being as yet unacquainted with the notes of the pygmy owl (*Glaucidium gnoma*) of this region, it occurs to me that the mysterious vocalist may possibly have been this curious little robber.

On two evenings recently at ten o'clock or later I have heard call-notes of some small birds from vacant lots in my neighborhood. They probably came from flocks of migrating finches of some species, whose cries I am as yet unable to identify. They were heard at intervals for more than an hour one evening.

Writing of birds, I am reminded of an incident of another sort which I witnessed a few weeks since. Passing along the margin of a wood my attention was attracted by angry bird notes, which were found to issue from

an Oregon junco (*Junco hyemalis oregonus*) and a Vigor's wren (*Thryothorus bewickii spilurus*) which were engaged in a spirited dispute. They made frequent passes at each other as they darted about the branches of a small tree, sometimes the junco and sometimes the wren being the aggressor. Presently a rufous hummingbird (*Trochilus rufus*) appeared upon the scene, and dashing fearlessly at the belligerents quickly put them both to flight. The wren came my way and alighted on a brush pile not ten feet distant, whither he was hotly pursued by the hummer. The latter overtaking him buzzed vigorously about his ears, while the wren with a fuzzled demeanor endured it for a moment and then sought relief in the depths of the brush heap.

J. M. EDSON.

New Whatcom, Wash,, Sept. 13.

NEW FIRE FROM THE LIGHTNING STROKE.

PROFESSOR O. F. COOK, of Huntington, L. I., who has returned from a journey in Liberia, gave the writer a most interesting account of a custom of the Golas of that country. The Golas apparently do not use fire sticks, but preserve fire carefully. When fire follows a stroke of lightning they hasten to secure a light from it, and putting out all the fires in the village, kindle them again from the new fire.

Lightning is very common in the Gola country, where in certain seasons there are five or six thunder storms in one day.

I regard this one of the most important contributions to the question of the origin of fire, and it shows an unexpected attitude towards the fire from lightning.

WALTER HOUGH.

U. S. National Museum, Oct. 17, 1893.

NOTES AND NEWS.

MR. L. C. WOOSTER, who for a year past has been in charge of the Kansas Educational Exhibit at the World's Exposition, has charge of the Science Department in the State Normal School of North Dakota at Mayville. Mr. Wooster has occupied a similar position in the Normal School at Whitewater, Wis.

—Mr. L. B. Avery, who for four years past has been at the head of the Science Department of the State Normal School at St. Cloud, Minn., has accepted the Presidency of the North Dakota State Normal at Mayville.

—The College of Physicians of Philadelphia announces that the next award of the Alvarenga Prize, being the income for one year of the bequest of the late Senor Alvarenga, and amounting to about one hundred and eighty dollars, will be made on July 14, 1894, provided that an essay deemed by the Committee of Award to be worthy of the prize shall have been offered. Essays intended for competition may be upon any subject in medicine, but cannot have been published, and must be received by the Secretary of the College on or before May 1, 1894. Each essay must be sent without signature, but must be plainly marked with a motto and be accompanied by a sealed envelope having on its outside the motto of the paper and within it the name and address of the author. It is a condition of competition that the successful essay or a copy of it shall remain in possession of the College; other essays will be returned upon application within three months after the award.

—Two articles in the November number of the *Atlantic Monthly* will be of particular interest to teachers. These are Horace E. Scudder's "School Libraries," and Ernest Hart's "Spectacled Schoolboys."

BOOK-REVIEWS.

The Science of Mechanics. By DR. ERNST MACH. Translated by T. J. McCormack. Chicago, The Open Court Publishing Co., 1893. 534 p., 12 mo. $2.50.

THIS interesting and learned work is the result of a methematician's study of the historical develoment of the science of pure mechanics—the mechanics of the mathematician, as distinguished from the mechanics of the engineer and the artisan. It is a critical and historical exposition of the fundamental principles of mechanics as rendered by Archimedes, Leonardo, Ubaldi, and Stevinus, in earlier times, and by Guericke, Boyle, Galileo, Newton and their successors in recent times. The development of the principles of statistics by the ancients and the im-

proved statements of the same principles by later writers are traced in a very interesting manner. The progress made in the production of a science of dynsmics is similarly exhibited, and the methods of exposition and proof adopted by Galileo, Newton, Huygens and the latter mathematicians are compared in a most instructive discussion. The construction of the science of mechanics, as now defined by the mathematician, is traced historically and logically, and this discussion is closed by a very suggestive chapter on the economy effected by the precision of thought and expression which the science of mechanics illustrates and promotes. The closing chapter on the relation of this science to other departments of learning is pecularly interesting, and is the only approach to metaphysical treatment in the book of any branch of the subject. A table of titles of the works of the great writers to whose treatises reference has been made is a valuable feature. The book will interest every mathematician.

The Locomotive Catechism. By ROBERT GRIMSHAW. Spon & Chamberlain, New York. 362 p. 12mo. $2.00.

THIS is one of those useful little books which are frequently supplied the artisan with the intention of giving him "practical" information in the most thoroughly peptonized form. The catechetic form is given the work in order that every idea may be distinctly grasped and question and answer impressed upon the mind permanently. It is a kind of book which is often much derided; but there is no question in the minds of those most familiar with their field, that they are well adapted to the use of the class of slow readers and inexperienced students to whom they are addressed. Their extensive sale and the fact that an author and his publishers venture to bring into the market a new work in a field already so long and so well occupied by the older and more familiar "Forney's Catechism of the Locomotive" are sufficient proof of a call for them. This little book is full of valuable information for the locomotive driver and his fireman, and for all who are interested in the steam-engine and its construction, even though not professionally. It is freely illustrated and will probably find extensive sale.

Outlines of Surveying and Navigation, for Public Schools and Private Study. By JAMES PITCHER, A.M. Syracuse, N. Y. C. W. Bardeen, 1893. 34 p. 12mo. 50 cents.

THIS litile book is intended to be used as a primer "to give the learner a brief outline of one of the most useful and delightful of occupations." It gives the elementary mathematical theory of the subject, and by the aid of the most elementary mathematics. The book is prepared "for the fireside as well as the school," and will probably find many interested readers and students among the boys on the farm, as well as among scholars in the high schools. The text is well expressed, the examples well chosen, and the illustrations satisfactory. The author concludes: "The foregoing pages have been prepared in the hope of contributing something to the increased intelligence of the boys and girls of our State and nation. Intelligent patriotism and piety will insure the success and the stability of our government"; and he appends Washington's "Farewell Address" as the best lesson in patriotism. Were all books written by authors of the same spirit and of equal patriotism, our boys would profit by the fact greatly, and our country gain commensurately.

EXCHANGES.

[Free of charge to all, if of satisfactory character. Address N. D. C. Hodges, 874 Broadway, New York.]

Would like to exchange 100 specimens of Canadian Indian Relics for a photo outfit. E. J. Waters, 33 Hoffman St., Auburn, N. Y.

For Sale.—A collection of fossil Rhinoceros bones (Aphelops fossiger Cope.) from the Loup Fork Tertiary, including all the bones of one fore and one hind foot, three vertebrae and ribs, and a nearly complete skull, with complete lower jaws. All the bones of the limbs are perfect. Price $250. Address Dept. of Paleontology, University of Kansas, Lawrence.

For Exchange.—Books and pamphlets on geology, ornithology, conchology, and entomology. State what line and I will send list. I want Odonota from any locality, and literature on this group. M. J. Elrod, Ill. Wes. Univ., Bloomington, Ill.

For Sale.—The remains of three individuals, one young and two adult, of Elephas Americanus found in Jasper Co., Mo. The remains comprise most of the skeletons, and comparatively little restoration would have to be done. The bones are in a good state of preservation and have not been worked out. For terms and further information address E. O. Hovey, 239 Center St., New Haven, Conn.

Bird skins scientifically prepared, with full data, in exchange for specimens from the U. S. not in my collection. Charles G. Smith, 2918 Lafayette St., Denver, Colo.

For Sale.—Holmes' System of Surgery by Packard. 3 vols., calf, 1881, new, for $15.00. (regular price, $21.00). Hares's System of Practical Therapeutics. 3 vols., calf, 1891, new, for $12.90. (regular price, $18.00.) Dr. Ashmead, 45 Macdougal St., New York.

Wants.

WANTED.—A copy of Mascart & Joubert's Lessons in Electricity and Magnetism, Vol. I. Address R. W. Clawson, Vanderbilt University, Nashville, Tennessee.

CHEMIST.—Graduate of a polytechnical school, and studied photographic chemistry in Germany and Austria. Situation teaching or in analytical or experimental laboratory. M. B. Punnett, Rochester, N. Y.

WANTED.—A recent college graduate to assist in editorial work on Science. Those seeking large emoluments need not apply. N. D. C. Hodges, 874 Broadway, New York.

A GRADUATE in medicine, experienced, will prepare or revise scientific and medical manuscript for publication, read proof, compile bibliographies, &c. Will also consult New York libraries for persons out of town wishing references to rare works. Address M. D., 104 Cambridge Place, Brooklyn, N. Y.

FOR SALE.—Volumes V. and VI. of the "Explorations for a Railroad Route from the Mississippi River to the Pacific." 1857, half calf, in good condition; a large number of colored and uncolored plates of Mammals, Birds, Fish, etc., etc. On receipt of $7.00 will send to any ordinary point in the U. S., express paid. These volumes are now rare. Address Dr. Shufeldt, Takoma Park, Dist. of Columbia.

A YOUNG woman who has been an assistant for a literary and scientific man desires a similar position. Is an experienced and accurate stenographer and typewriter, thoroughly educated, and sufficiently familiar with literary work to write, independent of dictation. Has some knowledge of the Spanish language. Will go to any part of the United States. Address, Box 147, Ravenna, Ohio.